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ABSTRACT

This study was designed (1) to determine differences in classificatory skills of low socioeconomic status children under intervention and non-intervention conditions; (2) to determine differences in classification skills of bilingual, biliterate, and monolingual students; and (3) to study differences in classificatory skills as a function of age. A total of 90 Mexican-American and Caucasian kindergarten, first grade, and second grade children were the subjects. Half of the children participated in an intervention program designed to develop classification skills. Instruction was conducted in groups of five bilingual, five biliterate, and five monolingual children in each of the three age groups. The findings indicate that the intervention group made significant gains over the control group in two modes (categorical-inferential and relational). There were no significant age differences between language groups, but significant age differences were present in the categorical-inferential and descriptive modes. The findings are discussed in terms of treatment, language, and age. Observations of pupil behavior during testing are also discussed. (SDH)

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THE CLASSIFICATION SKILLS OF FIVE, SIX, AND SEVEN YEAR OLD CHILDREN WHO ARE BILINGUAL, BILITERATE, OR MONOLINGUAL

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THE CLASSIFICATION SKILLS OF FIVE, SIX, AND SEVEN YEAR OLD CHILDREN WHO ARE BILINGUAL, BILITERATE, OR MONOLINGUAL

The ability to classify objects, events, and situations is recognized as a salient cognitive operation and a necessary basis for organizing one's environment in all areas of the experiences of life, both formal and informal. Today every individual finds himself in a complex, technological world that is building on two horns of a dilemma- that is, a world of abstractions and symbolizations on the one hand and a world of materialistic object bombardment on the other hand. The ability to classify and order both concrete objects and events, as well as abstract ideas and values becomes a necessity, bordering on physical and psychological survival.

In this kind of a society the development of a skill as important as classification cannot be left to chance. Thus, children need to be offered the opportunity to develop cognitive organizations to cope with the realities of a changing and ever expanding world. Therefore, this study, based largely on the theoretical rationale of Jean Piaget, is concerned with an extension of aspects of classification and its relation to modes of thinking.

The Problem

The problem of this study was concerned with (1) determining the differences in the modes of thinking in classificatory skills of lower socioeconomic class children who participated in an intervention program and those who did not; (2) discovering the differences in the classification skills of children of differing language literacy, that is, those who were bilingual, biliterate, or monolingual; and (3) determining the differences in classificatory skills as a function of age among five, six, and seven year old children.

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Rationale for the Study

Intervention. There is accumulating evidence that the ability to classify may be increased through intervention which provides experiences in problem solving by use of manipulative objects and materials. Piaget contends that in order to classify, the child needs a schema or cognitive structure of real objects. This schema is necessary to conceptualize a range of cues in order to relate the objects in his experiential world to his mental world. Language functions to point out relationships among objects and develop referents to non-physical attributes. Quality in language fosters mental images by which the child is able to understand the concept of an object under various guises, or, even, distortions. Thus, he conceptualizes his environment "as it is", not merely as it appears to his senses in immediate time and space.

Therefore, it was assumed that the young child's conceptual thinking is developed as he interacts with his environment. Likewise, his responses to objects tend to be influenced by the language which adults use to explain, interpret, and "distance" objects and situations. Therefore, in the experimental intervention program the actual manipulation of objects from the child's own environment combined with interpretative and corrective feedback from an experienced adult was deemed necessary.

Bilingual vs. Monolingual Modes of Thinking

Farther, since bilingual and monolingual children have been found to function differently on several important cognitive dimensions, the assumption has been made that bilingualism may effect conceptual thinking in particular ways. Numerous studies have advanced the premise that the use of language influences the ways in which a child views reality. (Feldman & Shen, 1969; Diebold, 1966; Jacobs & Pierce, 1966; Vygotsky, 1962; Bernstein, 1961; Leopold, 1949).

In studies comparing bilingual and monolingual children, bilingual children have been found to be superior in concept formation, in flexibility of thinking,

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in elaboration and originality, and in using conceptual strategies for divergent thinking (Peal and Lambert, 1962; Smart, 1969; Torrance & Gowan, 1970)

It has been suggested that children who hear the same ideas expressed in more than one language tend to understand objects based on their use and meaning rather than being dependent on words or symbols (Leopold, 1969; Jensen, 1962).

The Ages of Transition. The ages used for comparison in this study were chosen in order to determine the significance of the dynamics of transition in cognitive development since the child is moving from the termination of the pre-operational stage to the threshold of the concrete operational stage.

Piagetian theory postulates that a child during a transitional period is in a state of flux, is labile, and is in disequilibrium. Herein, we conceive the phenomenon of "horizontal decalage" in which the child is able to perform operations on certain materials but is unable to do so upon others. Thus, these ages may be crucial since intervention at this time may effect greater changes and learning than would intervention after conceptual strategies of classification have become rather firmly stabilized. If this is, indeed, a fact, training at a transitional period in development could be conducive to producing a basis for higher intellectual competence in young children.

Background of the Stages of Classification

Piaget's theory maintains that the child, interacting with his external environment, advances through a series of stages as he accelerates in his ability to classify.

Sub-stage one. Sub stage one extends from approximately 2 1/2 to 4/5 years of age. At this time the child is prelogical in his thinking and is limited in his skill to form classes. Although he has at his command vague or "loose" internalized representations of class, these are isolated and haphazard states which are not tightly structured into totalities or systems.

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Farther, the child at this stage usually bases his classification on the perceptual attributes of objects. Lacking mental imagery, he is unable to coordinate more than a few elements of an object because his thought is static. He is unable to represent mentally the criterion upon which he began his classification. Having no "hind sight" or mobility of thought backward, his thought is mobile enough to ascend, but he ascends only in one direction. He cannot ascend and descend in his mental structure simultaneously. Therefore, he does not posses "hind sight" or mobility of thought backward. Instead he utilizes a primitive preconcept of "spatial" or "graphic" extension. In other words, he uses space or other imaginary patterns rather than having mental ideas of a set of properties common to all members of a class which would distinguish one class from another. Likewise, the concept of class is difficult for the child because the combinations are constantly changing. A class does not appear stable in that its members are not constant or remain in a fixed position. And he has not yet developed sufficent mental images or representation to compensate for varying guises or distortions.

Sub-stage two. Sub-stage two takes place from ages five to seven. At this stage the child is able to make fairly stable dichotomies which evidence a higher degree of intension and extension. His thought tends to become more mobile and he has increasing "hindsight." It is the acquisition of mobility which enables the child to coordinate his classification. However, as yet, he is not able to understand class inclusions.

At approximately the age of six, the child commonly bases his groupings on the notion of belonging using a generic class name to provide equivalence. At this time there is a growing conceptualization which leads from the preconceptual phase to the beginning of concrete operations. In this transitional state he fluctuates between two stages of cognition in his attempt to establish stability.

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Sub-stage three. Approximately by the age of seven, the child reaches the third phase. Now he is at the threshold of concrete operations and is classifying according to the rules of logical operations. However, at this time of development, the child operates only on concrete empirical data (Flavell, 1963). His cognitive structure is no longer influenced by the demands of the immediate presence of perceptual cues. His classification organizations become highly structured systems. Therefore, any single classificatory act is related to the totality of the system of which any new examplar becomes an integral and enduring part. The child is able to operate on multiplicative classification tasks which is the ability to deal with two aspects of a situation at a time. To understand this procedure the child must be able to combine the attributes of two or even more classes. Therefore, this child is able to understand the notion of class inclusions within superordinate groupings. Within the theoretical framework of the above positions the present study was designed.

The Sample

The subjects were in attendance in an elementary school situated in a semi-industrial suburb near central Los Angeles, California. The ethnic composition was approximately 70 percent Mexican-Americans, 29 percent Caucasians, and 1 percent blacks, orientals, and others. Teacher judgment assigned 168 children of two kindergarten, two first grades, and two second grade classrooms into the language groups: bilingual, biliterate, and monolingual. After the three groups were determined, a sample of 90 children was drawn randomly.

This sample was assigned to two groups: 45 participants in an intervention program to develop classification skills, and 45 children to the control group.

The Criterion Measure

The criterion measure was the Rubber people and Animal Task developed by

the University of Arizona Research and Development Center (Tuscon, Arizona) for Early Childhood Education.

In this task the child was asked to put together the things which "go together." After he had grouped he explained his reasons for the grouping. These acts and his verbal explanations were recorded verbatim and analyzed to determine the classification cateogry according to the following four modes: categorical-inferential, descriptive, relational, and thematic.

Research Design

From these data five research questions were stated. For each research question, four statistical hypotheses were generated according to the three independent variable. A Tukey's HDS Test was completed on those levels of the independent variable in which were found significant differences in order to determine which groups within the levels showed a difference. Significance was computed at the .05 level.

The Intervention Program

The 45 children in the experimental group participated in an intervention program designed for the research. The program instruction was conducted in groups of five bilingual, five biliterate, and five monolingual children in each of the three age groups for six school weeks during 20-minute periods daily.

The objective underlying the intervention program was to develop intellectual processes such as: discrimination, comparison, contrast inferences, awareness of cause and effect, etc. by having the child interact actively with his environment.

Therefore, the children were trained by the use of intellectual tasks developed by the University of Arizona Research and Development Center for Early Childhood Education. These kits (tasks)* involved the use of objects drawn from

* Refer to end of presentation.

the child's everyday, common experiences of life. The objective was to structure a program for the development of conceptualization by using three-dimensional objects and items which the children could manipulate, feel, see, hear, etc. This activity was given direction by quality question-asking, role-playing, extensive verbalization and interaction among the group members.

Findings

The principal findings of this study indicated the following results:

Treatment. There was a significant difference in the mean gain between the control group in the categorical-inferential mode, in the relational mode, and in the summation of all the categories.

Language. There was no significant difference in mean gain among the language groups.

Age. There was a significant difference in the mean gain among the five, six and seven year old children in the categorical-inferential mode and between the five and seven year old children in the descriptive mode.

Conclusions

The findings are divided into a discussion concerning the three independent variables: treatment, language, and age.

Treatment

The research findings were not inconsistent with the theory on which the study was based or with the findings of other research.

Of particular interest was the fact that the experimental group made significant mean gains over the control group in the categorical-inferential mode. This mode takes into consideration objects as whole entities in that objects are not organized on a single abstract physical property. Therefore, any object of the group is an instance of a conceptualization. This mode is traditionally

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correlated with high scores on IQ tests and considered an analytical approach to thinking (Kagan, Moss, & Sigel, 1963). These authors suggest that children who group in this mode are at a conceptually higher level than those who do not group in this way. Accordingly, it may be inferred that children who employ this mode are using an analytical approach to classification which is a higher order of categorization. Since the experimental group was grouping on this level most frequently, this may imply that after intervention, this group was using a superior type of conceptualization.

Since the control group did not make significant gains in the categorical-inferential mode, this fact leads to the assumption that the traditional curriculum does not provide opportunities for this kind of conceptualization to take place.

There was no significant difference in the mean gain between the two groups in the descriptive mode. The descriptive mode is defined as groups formulated on physical attributes such as size, color, form, or physical position. This recognition is based on perceptual attributes. The experimental group did not classify in this category which seems to belie Sigel's statement: "Lower-class children have a more limited criteria for grouping and tend to group more frequently on obvious manifest characteristics such as color and form [Sigel, Young Children, 1971, p. 183.]

Since the experimental group classified on criteria other than those that Sigel contended lower-class children usually use, it can be inferred that lower-class children are able to learn to group not only in superior ways, but in more varied ways. Therefore, intervention programs may facilitate the development of children's ability to organize thought in multiple ways.

The relational mode showed a significant difference in the mean gain between the groups. The use of the relational mode indicated an understanding of relations among objects in a group or physical and positional relationships. This

mode is also considered to involve an analytical approach to classification and, thus, may reflect a higher form of intellectual functioning.

The thematic mode showed no significant gain between the groups. As defined in this study, thematic grouping is organized on the basis of a story, incident, or theme of the objects within the grouping. Bruner et al. (1956) suggested that using the thematic mode was a low level approach to a grouping task. Kagan et al. (1963) lent support to this idea. However, Wallach and Kogan (1965) argued that the development of themes may be a creative approach to the task which shows a tendency for the child to employ flexibility in his thinking strategy.

It should be noted, also, that should a child classify in a certain way, it does not mean he is unable to classify in any other way. The kinds of materials and objects with which the child is working may influence the criteria by which he chooses to group. However, the present study encouraged the subjects to utilize every criteria available to them.

In the summation of the categories, the experimental group increased significantly in their ability to classify in multiple modes. Awareness of multidimensionality in classifying objects may indicate flexibility in thinking, in that objects were seen as having multiple functions or having multi-faceted dimensions; that is, the child was able to recognize that a number of attributes may be used as a criterion for grouping. The ability to classify in varying modes also demonstrated the ability to decenter.

Language

Differences in language experience was not a factor in increasing the ability to classify in either the experimental group or control group or at any age. However, the use of three dimensional objects which are familiar in the common, everyday experiences of the child, may assist young children in

formulating his conceptualizations of groupings to such an extent that knowledge of several languages are neither a contributing or limiting factor.

Age

In the categorical-inferential mode the mean gain between all the ages and in the descriptive mode, the mean gain between the five and seven year old children were at the level of significance (p .05). In both instances, as could be expected, the greatest gain was between the five and seven year old children. These findings have been substantiated by theoretical rationale (Inhelder & Piaget, 1969).

Significant mean gains were made by the experimental group in the interaction between age and treatment. In this group the older children responded with more gain from the intervention program than the younger ones. Such a result was not unexpected.

It should be noted that there was an increase in the average mean gain of the five, six, and seven year old children in both groups. However, with age the average mean gain of the experimental group increased while the control group decreased. This may indicate that children who are exposed to limited schooling have few opportunities to develop their full potential. There is evidence that lower-class children who initially are successful with school tasks do not continue to increase their success, but, rather, decline with advancing years. This may be another example of the cumulative deficit model.

Observations of Pupil Behavior
during the Testing Period

Of special interest was the observation that those who had participated in the intervention program were particularly challenged and engaged actively in the classification problem during the final testing period. After a great deal of effort had been expended by the child in working to solve the task and, seemingly,

he had grouped in every conceivable way, the child would often strain to accomplish more grouping patterns. Typically, he thought he could think of more ways to "put the things together."

This was not the case with the child from the control group. More often, this testee would arrange his groupings and be unable to solve the task in any other ways. Unlike the child from the experimental group, he seemed not to strain for solutions, since, theoretically, he had not been exposed to opportunities to develop cognitive conceptualization processes from which to draw. Usually, he merely said something like this: "I cannot think of anything else" and did not proceed further.

Teachers' Reactions to the Intervention Program

In reporting observations and impressions, the teachers stated that, in general, those children who had been subjected to the intervention program became more verbal and confident compared to their behavior prior to the program. Likewise, these children were able to solve the problems of cognitively oriented games more quickly and accurately than those not in the intervention program.

The teachers reported a high interest in the research program materials since it involved manipulation of a variety of three-dimensional objects which were changed daily and maintained the children's curiosity and attention span.

Summary

On the basis of the discussion of the findings, several conclusions are tenable within the limits of the evidence of this study. These are presented here:

1. It is possible to increase the classification skills of lower-class children.
2. The type of intervention used has an effect on the development of multiple modes of thinking.
3. Children who participate in an intervention program use the analytical ways of grouping to a greater degree than the lower orders of categorization.

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4. Children who participate in a classificatory intervention program use a greater number of variety of modes of grouping.

5. Knowledge of one or more languages does not seem to be related to learning of classificatory skills. However, the use of real objects may facilitate a child's grouping procedure to such an extent that he is not dependent upon the use of language to explain his representations.

6. As children increase in age, they also accelerate in number of responses and variety of modes of categorization.

Recommendations

In view of the present findings one salient recommendation is proposed. It is merely this: To develop curriculum for young children using appropriate intervention programs consistent with and related to a child's real, everyday, experiential world. The objective is clear: To develop a child's intellectual processes.

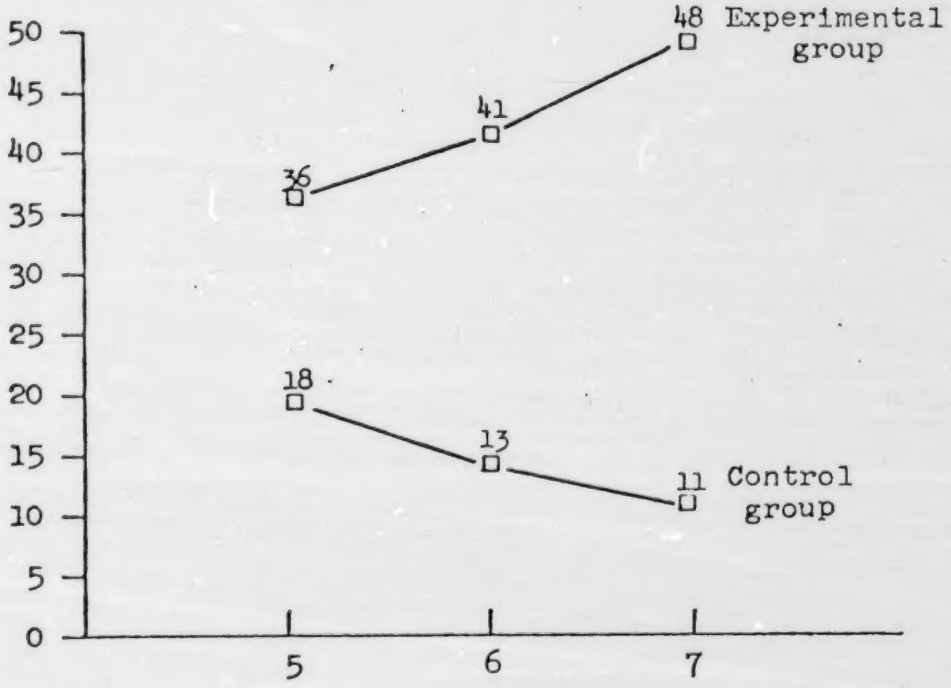

Fig. 2. Average of all mean gains of interaction between treatment and age

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LIST OF KITS USED IN EXPERIMENTAL PROGRAM

1. Buttons
2. Footwear
3. Round objects
4. Square objects
5. Rectangular objects
6. Sticky items
7. Boxes, bags, and containers
8. Paper items
9. Kitchen utensils
10. Kitchen (reviewed), bathroom and living room objects
11. Sink and float articles
12. Objects which give out light
13. Clothing
14. Fasteners
15. Objects that roll and are pointed
16. Seeds
17. Sticky, rough, and smooth objects
18. Objects that fold, squash, or bend
19. Foods
20. Objects that are long or short
21. Plates, cups, and glasses
22. Tools
23. Vehicles
24. Eating utensils
25. Hair materials
26. Materials and fabrics
27. Articles of measurement
28. Ice cream cones and bars (simulated)

29 & 30. Two classification games

Note: The last three lessons were the only ones which used pictorial representations.

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